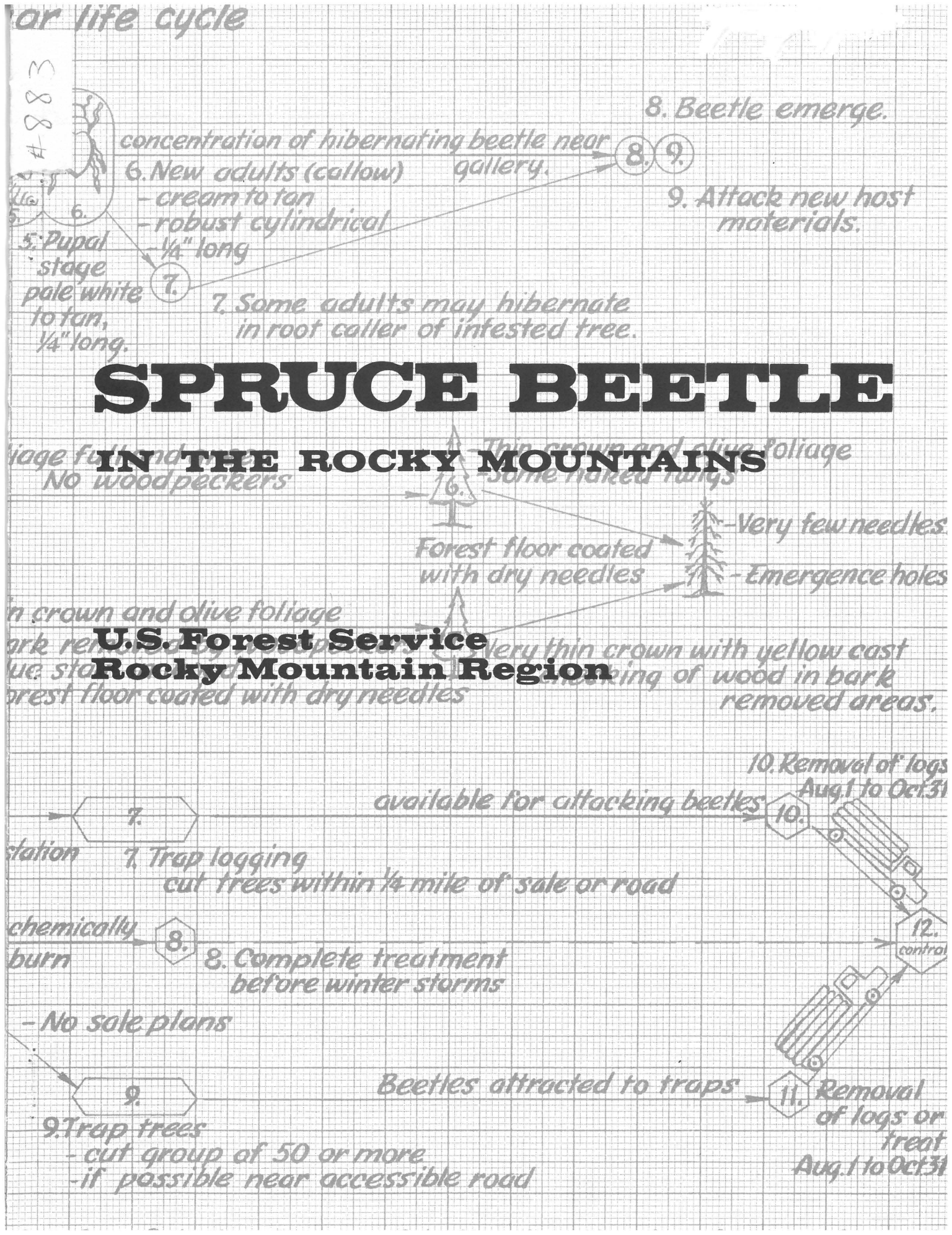
SPRUCE BEETLE

IN THE ROCKY MOUNTAINS

U.S. Forest Service
Rocky Mountain Region


life cycle
#883
concentration of hibernating beetle near gallery.
6. New adults (callow)
- cream to tan
- robust cylindrical
- ¼" long
5. Pupal stage pale white to tan, ¼" long.
7. Some adults may hibernate in root collar of infested tree.
8. Beetle emerge.
9. Attack new host materials.
No woodpeckers
Some naked twigs
Very few needles
Forest floor coated with dry needles
Emergence holes
Very thin crown with yellow cast
removed areas.
10. Removal of logs
Aug. 1 to Oct. 31
available for attacking beetles
7. Trap logging
cut trees within ¼ mile of sale or road
8. Complete treatment
before winter storms
- No sale plans
9. Trap trees
- cut group of 50 or more
- if possible near accessible road
Beetles attracted to traps
11. Removal
of logs or
treat
Aug. 1 to Oct. 31

SPRUCE BEETLE IN THE ROCKY MOUNTAINS

By

Donn B. Cahill

INTRODUCTION

The spruce beetle, Dendroctonus obesus (Mann.) (= D. engelmanni Hopk.), is the primary insect pest of Engelmann spruce in Region 2. Spruce beetle is a native insect of merchantable spruce stands in western North America. Some loss is to be expected in overmature stands and the finding of single, widely scattered infested trees is not necessarily an indication of an outbreak.

The destruction caused by this insect in 1939 to 1953 resulted in a loss of approximately 4.5 billion board feet of timber. This epidemic developed in the heavy windfall of spruce that occurred during 1939 on the Grand Mesa, White River and Routt National Forests. Another outbreak developed in southwestern Colorado on the Uncompahgre and San Juan National Forests following a blowdown of Engelmann spruce in 1950. In southwestern Colorado approximately 127,000 infested trees were logged and 480,000 trees were chemically treated at a cost of one and a half million dollars.

Since these large outbreaks occurred numerous smaller outbreaks have been controlled by logging, chemical control, and slash treatment.

HOSTS AND DISTRIBUTION

Engelmann and Colorado blue spruce are the first to be attacked, and under epidemic conditions, lodgepole pine are attacked. The spruce beetle occurs throughout the range of Engelmann spruce in western North America.

DESCRIPTION

This insect has four development stages in its life cycle.

Egg - Pearly white, oblong, from 0.75 - 1.0 mm long.

Larva - Stout, cylindrical, legless and wrinkled. Head pale tan, body creamy white. When full grown the larva is 6 - 7 mm (1/4 - 5/16 inch) long.

Pupa - Creamy white, becoming pale tan near maturity, about 6 mm (1/4 inch) long. Wings. legs and antennae are visible.

Adult - A robust, cylindrical beetle about 6 mm (1/4 inch) long. Callow adults range from pale yellowish to medium brown; mature adults are all black, or may have the head and thorax black and the hard front wings reddish brown.

LIFE HISTORY AND HABITS

In Region 2 the spruce beetle usually has a 2-year life cycle. Some populations, or parts thereof, may mature in one or three years, depending on site factors such as geographical location, elevation and variations in the summer mean temperature.

Adult beetles will emerge and attack fresh host material from late May to early July. Windfall, freshly cut logs and shaded slash are preferred but where such material is not sufficient to absorb the population, standing trees are attacked.

The heaviest attack in standing trees is concentrated on the lower part of the bole. The female beetle bores through the bark until the sapwood is reached, and then begins excavating the egg gallery. The male enters the gallery, mates with the female and remains in attendance until the gallery is completed. The egg gallery is a tunnel extending upward from the entrance hole between 4 to 12 inches in length. Eggs are laid in groups on alternate sides of the gallery.

The egg gallery of the spruce beetle is distinguished from other secondary bark beetles because boring dust (frass) is tightly packed in it.

The eggs hatch in about 2 or 3 weeks and the larvae work away from the parent gallery, feeding on the inner bark. They feed together until about one-third grown, then form individual mines. In the two-year life cycle, the larvae overwinter and complete their growth, pupate, and reach adult stage the following summer. These young adults (callow) may spend the second winter in their pupal cells or they may emerge, crawl or fall to the base of the tree and reenter it at the root collar, where they excavate hibernating chambers in thick bark.

The initial attacks of the spruce beetle in standing trees (mature and overmature) commonly occur in this order of susceptibility; (a) near recent windthrown or logged areas, (b) in creek bottoms, (c) on benches and high ridges. The most susceptible stands are over 120 years of age.

DETECTION

1) Boring dust - This is an important indicator during the first summer but it becomes less conspicuous in fall and winter due to the action of rain, wind and snow. The boring dust is light brown and about as coarse as sawdust from a handsaw. It may be found in bark crevices, heavily scattered around the root collar. Careful inspection of every tree is necessary if a detection survey is to be accurate. The removal of portions of bark on detected trees will confirm presence of beetles.

2) Woodpecker work - Flaking off of the outer bark scales by woodpeckers is conspicuous. Trunks of trees worked by woodpeckers are reddish-purple instead of normal grey. They are most noticeable in early spring after birds have spent the winter working on infested trees; there may be heaps of bark on the snow or ground around the base of an infested tree. Woodpecker activity, when present, is an excellent indicator of infested trees. This should be verified by removing bark and looking at galleries.

3) Foliage color - Dying and dead spruce do not assume the bright red color common to most dying conifers. Fading of the foliage to yellowish green or pale green will not be noticeable until midsummer after the first winter. The needle loss will increase and by fall the tree from a distance will have a brown appearance and the forest floor directly beneath the crown will be covered with dry grey needles.

NATURAL CONTROLS

1) Climatic factors - Low temperatures in winter or early fall have been known to wipe out infestations. Sub-zero temperatures in January and February 1951 killed 75 percent of overwintering larvae in Colorado and helped to bring the outbreak under control. Hibernating adults protected by a mantle of snow would rarely be subject to such extreme temperatures.

2) Woodpeckers - Woodpeckers are a very effective check on spruce beetle populations and have been known to reduce them by 90 percent in standing trees. The value of woodpeckers lies chiefly in their ability to detect scattered infested trees in an incipient outbreak and reduce beetle potential by concentrating on them throughout the winter.

3) Insect parasites and predators - Mortality caused by these factors is generally low but can be significant in some situations.

APPLIED CONTROL ALTERNATIVES

Control of an infestation by logging - Strict rules of sanitation should be observed. Stumps should be cut low; cull logs and large slash (over 8") should be disposed of (burned or chemically treated), preferably after they have served as trap material during the flight period. Clearcutting of infested patches is more effective than selective logging of currently infested and dead trees. Logging, properly timed, is most useful in reducing beetle populations as the beetles prefer the freshly cut green trees to those that are standing. When this is done, infested logs must be removed before winter storms. Fringes of the clear-cut area should be checked for blowdown each year for three years after sale termination.

Trap trees - Trap trees are used on known infestations to trap an epidemic population in a select area. Before trap trees can be used, the infestation should be evaluated by an entomologist from the Regional Office. Trap trees should be a group of 50 or more uninfested trees within one-fourth mile of known infestation. Trap trees should be located in accessible places to encourage salvage. Trees are cut in late fall and removed from the stand the following year after August 1 and before October 31 or chemically treated.

Trap area - Trap areas are incorporated into a spruce sale, so that cut trees will be available during beetle flight. Trap areas should be placed within one-fourth mile of logging debris that may produce beetles. In these areas, trees are felled between September 1 and October 1 and removed from the area the following August 1 to October 31.

Chemical control - Beetle broods, in infested trees and logs that cannot be removed before beetle emergence, can be killed by sprinkling or spraying the bark with an ethylene dibromide emulsion. This material is a mixture consisting of one gallon of concentrate with two pounds of ethylene dibromide added to four gallons of fuel oil or water.

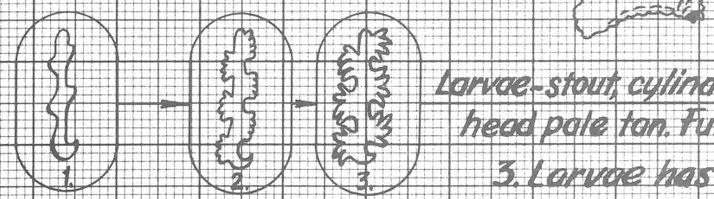
PREVENTION

Prevention of serious spruce beetle loss lies in the vigilance of the woods personnel. Workers must be able to recognize the symptoms of infested trees in logging areas and residual stands with blowdown.

Further information, training and detection service is available from the Forest Insect and Disease Branch at your Regional Office.

U. S. Forest Service
Division of Timber Management
Denver Federal Center, Bldg. 85
Denver, Colorado 80225

A. Spruce Beetle Activity ~ 2 year life cycle

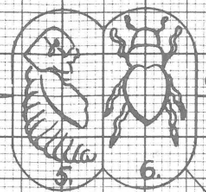


1. Attack period
- 7" egg gallery
- eggs on alternate sides.
- eggs ~ pearly white 1.0 mm. long.

2. Larvae feeding together horizontally to egg gallery.

3. Larvae has separate feeding galleries.

Larvae - stout, cylindrical, legless, white with head pale tan. Fully grown 1/4" to 5/16" long. (4.)



4. Larvae resume feeding.

5. Pupal stage pale white to tan, 1/4" long.

6. New adults (callow)
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8. Beetle emerge.

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B. Host Tree Indicators

- Foliage normal
- Boring dust
- Entrance holes
- Adults constructing egg galleries.

No woodpeckers

- Foliage full and green
- No woodpeckers

Foliage - full and green with woodpeckers

- Thin crown and olive foliage
- bark removed by woodpeckers
- blue stain in wood
- forest floor coated with dry needles

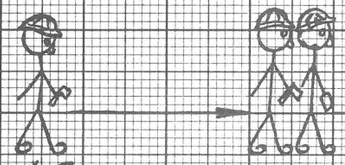
- Thin crown and olive foliage
- Some naked twigs

Forest floor coated with dry needles

- Very few needles.
- Emergence holes.

Very thin crown with yellow cast
checking of wood in bark removed areas.

C. Control Activity



1. Spruce survey
- Indicators (3,4 & 7
- Areas to check (✓)
  - ✓ wind thrown
  - ✓ logging
  - ✓ creek bottoms
  - ✓ benches
  - ✓ high ridges
  - ✓ stands over 120 years of age

2. R.O. Entomologist makes biological evaluation

(5.) Plan sale areas

Static or decreasing infestation in wooded area.

Increasing infestation (4.) Treat chemically or burn (8.)

8. Complete treatment before winter storms

- No sale plans

3. Type of action
- decreasing infestation in a non-road area.

(6.) 6. wait and see.

(9.) 9. Trap trees
- cut group of 50 or more
- if possible near accessible road

(7.) 7. Trap logging cut trees within 1/4 mile of sale or road

(10.) 10. Removal of logs Aug. 1 to Oct. 31 available for attacking beetles

Beetles attracted to traps (11.) 11. Removal of logs or Treat Aug. 1 to Oct. 31

May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct.

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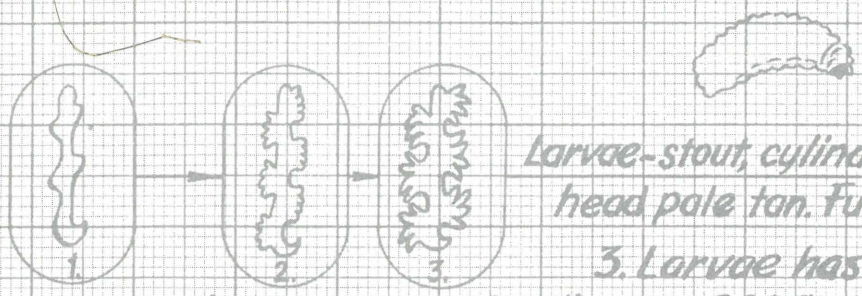

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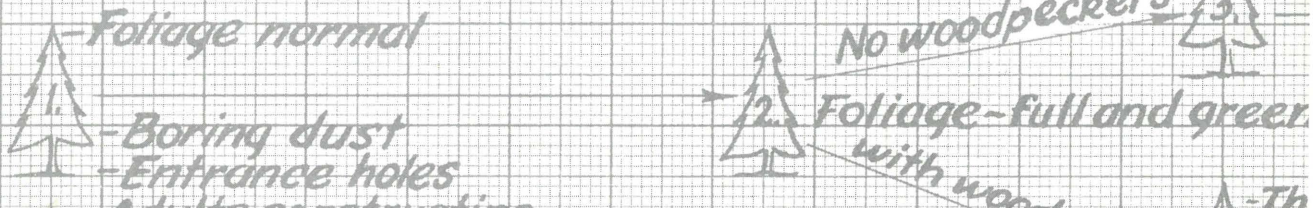

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3. -Fo

4. -Th
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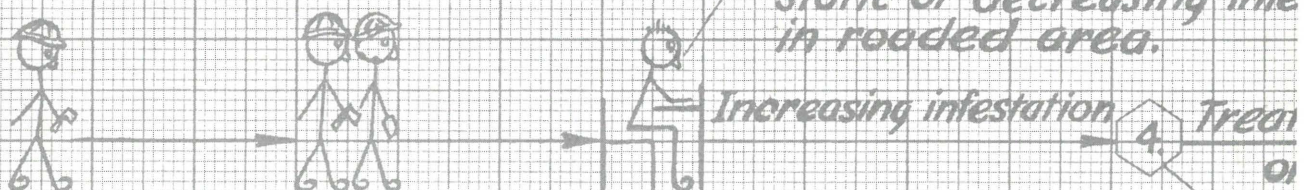

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